REMARKS

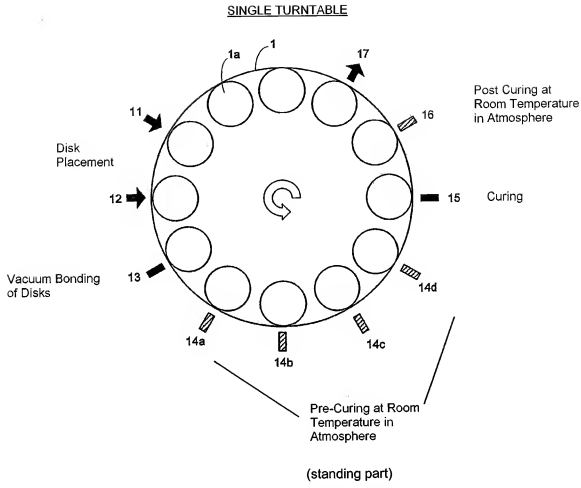
Applicant appreciates the Examiner pointing out the typographical error in dependent Claim 19, which was intended to depend from independent Claim 18, and does not simply repeat the same limitations of independent Claim 15.

The Office Action contended that Claims 17 and 20 were objected to pursuant to the first paragraph of 35 U.S.C. §112. Applicant would direct the attention of the Examiner to the first embodiment as described in Paragraph [0063] as follows:

> [0063] First, a first embodiment of the present invention will be described. Specifically, as is shown in FIG. 1, the present embodiment uses a 12-position turntable 1 as a conveying means for conveying substrates from the bonding part to the curing part. This turntable 1 rotates while carrying substrates or susceptors that carry substrates. 12 substrate carrying parts 1a are constructed along the circumference of this turntable. The respective substrate carrying parts 1a are constructed so that these parts pass through substrate placement positions 11 and 12, a bonding position 13, pre-curing standing positions 14a through 14d, a curing position 15, a post-curing standing position 16 and a conveying position 17 as the turntable 1 rotates. (underline added)

Thus, the claimed rotatable conveying unit can consist only of a turntable to convey substrates or susceptors conveying substrates to each processing station, as defined in Claim 1.

When the substrates are moved through a bonding position, pre-curing standing positions and a curing position, the substrates are carried on the conveying means, so that no shifting of the substrates are performed by other devices. At least from the bonding part to the standing parts and the curing part, the substrates are conveyed without any moving contact with devices other than the conveying means. Accordingly, the substrates can settle into a stable flat state by avoiding any shifting operation, so that any tilting can be suppressed.



If there are any questions with regards to this disclosure, applicant would appreciate a telephone conference from the Examiner.

As can be determined from the references cited of record and applied, this is a relatively crowded field with large corporations attempting to seek competitive positions in view of the significant development of optical disks and DVDs restoring large quantities of information such as movies.

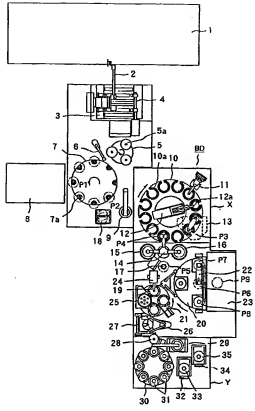
As can be appreciated, the different embodiments of the present invention enable a smaller more compact operation than a bonding apparatus by uniquely recognizing a problem and offering a solution that has not been provided by this relatively crowded art.

By using a turntable configuration when compared with bonding apparatus that use basically rectilinear conveying paths alone or in combination with a number of separate turntables, it is difficult to provide a compact bonding apparatus, as set forth in our specification, as follows:

> [0012] The present invention was devised in order to solve the conventional problems described above; it is an object of the present invention to provide a bonding apparatus and bonding method which can ensure a sufficient standing time following substrate bonding by means of a simple and compact apparatus, so that warping can be prevented.
>
> [0013] In order to achieve such an object, the present invention is characterized by the fact that in a bonding apparatus which has a bonding part that bonds a plurality of substrates coated with an adhesive agent, and a curing part that cures the adhesive agent of the bonded substrates, this apparatus further comprises conveying means for conveying the substrates from the abovementioned bonding part to the abovementioned curing part, and the abovementioned conveying means has a standing part which allows the bonded substrates to stand at room temperature in the atmosphere.

The Office Action rejected Claims 1-4, 7 and 8 as being obvious over *Matsumoto et al.* (U.S. Patent Publication 2003/0104097) in view of *Miyano et al.* (U.S. Patent No. 6,312,549).

It is readily apparent that the *Matsumoto et al.* disclosure is directed to a substantial rectilinear conveying path using numerous independent turntables for each station as recognized in the Office Action rejection and seen in FIG. 1.



Matsumoto et al.'s teaching to correct warping before the adhesive is cured is a multistage operation where a donut-shaped application of adhesive is applied by supply nozzle 12a on turntable 10 where the disc substrate is overlapped with another disc substrate and delivered to spinners 15 or 16 which will then spin the overlapped two sheets of disc substrates, presumably to spread the adhesive. See Page 9, "spinner which spins the overlapped two sheets of disc substrates."

As noted in Paragraph [0054], the sheets of the adhered disc substrates are mounted on a receiving stand 17 and then moved and mounted on a turntable 20. A weight such as an aluminum plate or a heat resistant glass is applied to each heat treated disc substrates, where as

noted in Paragraph [0056], "this weight serves to assist an adjustment of the warped quantity of the disc substrates." (underline added)

Immediately after removing the weights that purportedly have cooled the heated substrates, ultraviolet rays are applied to cure the liquid adhesive. During application of the ultraviolet rays from an Xenon lamp, the amount of the warped quantity of the disc are detected and converted into electrical signals so that the pair of opposite side ultraviolet radiators 23b and 23c have controlled outputs to adjust for any magnitude of warp and purportedly provide a substantially flat optical disc, as follows in Paragraph [0101]:

> [0101] n this embodiment, ultra-violet ray radiators 23b and 23c radiate ultra-violet rays through both sides of mutually adhered two disc substrates. Since a direction of a warp of the adhered two sheets of disc substrates is uniform, the quantity of ultraviolet ray radiators 23b and 23c are adjusted and the warp can be reduced. The warp quantity is detected for each of the overlapped disc substrates and converted into an electrical signal so that the quantity of ultra-violet rays outputted from ultra-violet radiators 23b and 23c is controlled. At this time, a substantially flat optical disc regardless of a magnitude of warp can be achieved. (underline added)

Apparently, the only time that the discs are returned to ambient temperature, is when they finally reach an inspection device on Table 21. See Paragraph [0063].

Thus, to a person of ordinary skill in this field, the *Matsumoto et al.* reference teaches addressing any disc warping by placing cold weights on the hot disc substrate and then further monitoring the discs as they are further heated by Xenon light for a UV curing while varying the UV application to both sides of the discs, purportedly to balance any warp.

There is no recognition of our solution to the warp problem in the *Matsumoto et al.* disclosure. *Matsumoto et al.*'s teaching can be contrasted with our stress annealing with no

further contact of the discs teaching to a person of ordinary skill in the field in our specification by constantly moving the *Matsumoto et al.* discs as follows:

> [0067] In this respect, holding arms of the other movably mounting devices 6, 9, 14, 19, and 26 carry out the rising operation, lowering operation, and horizontal turn operation.
>
> [0068] It is noted that a plurality of stackers 31 are removably mounted on good product table 30 at constant intervals. When a predetermined number of the optical discs are mounted, table 30 is rotated and the optical discs are mounted on the subsequent stacker 31 on good product table 30. The non-good product is mounted on a non-good product table 32 or 34. The manufacturing process is then ended.

In *Orthopedic Co., Inc. v. United States*, 217 USPQ 193 (C.A.F.C. 1983), the Federal Circuit set forth a useful guide for determining the scope and content of the prior art. Orthopedic, at pages 196-197, also focuses on the "problem" faced by the inventors:

> In determining the relevant art. . . one looks at the nature of the problem confronting the inventor.
>
> * * *
>
> [W]ould it then be nonobvious to this person of ordinary skill in the art to coordinate these elements in the same manner as the claims in suit? The difficulty which attaches to all honest attempts to answer this question can be attributed to the strong temptation to rely on hindsight while undertaking this evaluation. It is wrong to use the patent in suit [the patent application before the Examiner] as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit. Monday morning quarterbacking is quite improper when resolving the question of nonobviousness. (Emphasis added)

Thus, one highly relevant inquiry in making an evaluation under 35 U.S.C. §103 is "[t]he relationship between the problem which the inventor. . . was attempting to solve and the problem to which any prior art reference is directed." *Stanley Works v. McKinney Mfg. Co.*, 216 USPQ, 298, 304 (Del. D.C. 1981). Thus, in analyzing the prior art under Section 103 of the Act, we

must clearly comprehend the problem addressed by the present inventors and that problem must be compared or contrasted, as the case may be, with the problems addressed by the prior art.

Pursuing further the "problem" analysis required under Section 103 of the U.S. Patent Act, the applicability of any reference against the claims of a pending U.S. patent application requires compliance with In re Gibbons, 100 U.S.P.Q. 298, where it is stated:

> In considering the questions of invention, it is necessary to determine whether or not the art relied upon contains adequate direction for the practice of the invention without resort to the involved application. (Emphasis added)

The Office Action further asserted that since the *Matsumoto et al.* reference did not teach a vacuum vessel but sought to eliminate air bubbles by an application of a voltage, that this would cause a person of ordinary skill in the field to conclude that a teaching of the *Miyano et al.* reference to provide a vacuum vessel, as shown in Figures 7 and 8 to eliminate air bubbles, could teach collectively our invention of solving a problem of annealing by the relief of internal stress of the substrate prior to a curing.

Note, the *Matsumoto et al.* reference applied cold weights to physically deform and stress warped disc substrates and then immediately heated the substrates while measuring the warp and adjusting the amount of UV radiation from one side to the other side to counter a warping problem. Note, the adhesive bonding is also being cured by the UV application in an effort apparently, to balance the internal stresses that are generated.

As noted, our present apparatus enables the internal stresses from forcibly bounded flat planes to simply stand "prior to the bonding" so that there is little warping as the internal stresses are relaxed by the predetermined standing period of time. Note, this may increase the production

time which is countered intuitive to attempts to increase yield from a disc foundry, which would make our present invention even less obvious to a person of ordinary skill in this field.

It is respectfully submitted, however, that the *Miyano et al.* reference could not teach to a person of ordinary skill in the field, our present invention, since the *Miyano et al.* reference directly teaches away from Figures 7 and 8 cited by the Office Action, as can be seen in Column 2, Lines 17-27, as follows:

> However, the abovementioned conventional arts are inherently bound with the following problems and shortcomings. That is, in the first and second conventional arts, since vacuum chambers 26 and 32 having a greater capacity such that they can cover the disk plate are employed, the device itself becomes large-scaled, and the production cost is increased. Further, in these types of vacuum chambers 26 and 32, since the inner capacity is great, it is necessary to increase a vacuuming force, wherein a lengthy period of suction (vacuuming) is required in order to get an appointed pressure condition, and the working efficiency is incorrect.

Not only does *Miyano et al.* teach away from Figures 7 and 8, it actually teaches a pressure fitting disc at a disc pasting step P1 shown in Figure 1, where the respective discs are pressure warped while at the same time an ultraviolet ray is irradiated onto the adhesive lamp to cause the agent to be hardened, as forth in Column 7, Lines 11-17, as follows:

> The disks D3 are pressure-fitted to each other while securing the flatness of the disks to cause the adhesive agent 4 intervened between the disks D1 and D2 to be widened, and at the same time, a ultraviolet ray is irradiated onto the adhesive agent 4 to be hardened. Finally, the disks D3 are adhered and fixed to each other (Ultraviolet ray irradiation step illustrated by reference symbol P3). (underline added)

In summary, *Miyano et al.* would teach, like the *Matsumoto et al.* disclosure, to cure the disc under a state of being pressure forced into a flatness with internal stress.

Referring to our amended Claim 1, we specifically define that there is no shifting of the substrates at any interval between the bonding part to the curing part. In essence, as seen in each of the embodiments of the present invention, we provide particularly, after a vacuum bonding of

the disc, a pre-curing at room temperature in atmosphere to remove any internal stress for a set predetermined time period before we cure the disc.

These same features are carried forward in accordance with 35 U.S.C. §112, sixth paragraph, in our means for rotating the conveying unit of independent Claim 15 and independent Claim 18.

The MPEP §2182 states that "application of a prior art reference to a means or step plus function limitation requires that the prior art element perform the identical function specified in the claim. However, if a prior art reference teaches identity of function to that specified in a claim, then...an examiner carries the initial burden of proof for showing that the prior art structure or step is the same as or equivalent to the structure, material, or acts described in the specification which has been identified as corresponding to the claimed means or step plus function." The "means or step plus function" limitation should be interpreted in a manner consistent with the specification disclosure. See *In re Donaldson Co.*, 16 F.3d 1189, 29 USPQ2d 1845 (Fed. Cir. 1994).

The Office Action further rejected Claims 15, 18 and 21 as being obvious over a combination of *Hosogai* (Japanese Laid-Open Patent Application 10-289491) in view of *Kotoyori* (Japanese Laid-Open Application 2002/074759) and in view of *Higaki et al.* (U.S. Patent Publication 2002/0108715).

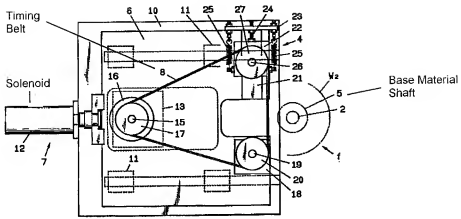
Hosogai (Japanese Laid-Open Patent Application 10-289491) discloses a substrate rotary position (f) where the bonded substrates are spun to uniformly distribute an adhesive S. However, *Hosogai* does not disclose the function of our conveying means having a standing part which allows the bonded substrates to stand at room temperature in an atmosphere out of the vacuum vessel while conveying a plurality of substrates for a time period, e.g., 7 seconds

required for correction of the warping. "Spinning substrates to uniformly distribute the adhesive" does not mean "standing the substrates for correction of the warping." 35 U.S.C. §112, Paragraph 6 has not been complied with.

The *Hosogai* reference specifically sought to address a problem associated with decreasing the inertia movement of a turntable that intermittently indexed and rotated at respective working stages, where the products were subject to an adhesive coating, a high speed rotation to remove excessive adhesive material, and subsequent irradiation with UV to cure the adhesive.

The solution to his problem involved a solenoid for driving a shaft (5) by a unique arrangement of a driving belt (8) that can take the form of a timing belt (8). A pair of guide pulleys (20, 27), one of which can be spring biased can be moved together against a substantial surface of the aft or "peripheral face of the solid of revolution 5" to thereby provide a positive driving and stopping of the work piece and improve the indexing and positioning accuracy of the base material, as can be seen from the following Drawings 3 and 4:

DISENGAGED



[Drawing 3]

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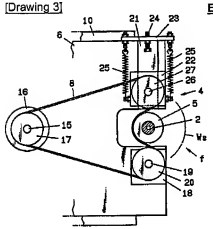


[Drawing 4]

The Office Action acknowledged that the *Hosogai* reference did not teach a standing part of our Claim 1 which allowed bonded substrates to stand at a room temperature in the atmosphere after the initial bonding.

The Office Action asserted, however, that *Kotoyori* addressed the problem of stress and warpage before a curing state, citing the Abstract and Paragraphs 0005 and 0008. The Abstract notes a two part UV irradiation process, the source of UV being moved with an initial small dose of the UV applied for only a partial curing, while a second higher application of UV radiation is applied while the center hole stays free from mechanical stress. Note, curing will capture and

freeze the relative stress state in the discs. The *Kotoyori* teaching is defined as follows, in Paragraph 0009:

> [0009] Therefore, this invention piles up the single plate disk of two sheets via UV cure adhesive, where alignment is mechanically carried out for those center holes, the 1st UV irradiation is performed, UV cure adhesive is made to thicken, the above-mentioned center hole makes it hard to shift, the 2nd UV irradiation is performed in the state where mechanical stress is not given to the center hole after an appropriate time to such an extend that curvature does not occur on the single plate disk of the two above-mentioned sheets, and SUBJECT that the small lamination disk of curvature is obtained is attained. When performing the 2nd UV irradiation, SUBJECT that the lamination disk in which curvature is still smaller is obtained is attained by carrying out adhesion maintenance of the single plate disk of two sheets piled up on the flat face of a support member via UV cure adhesive, and carrying out in the small state of curvature.

Kotoyori (JP 2002-074739) does not disclose a conveying means which conveys the substrates from a vacuum vessel into an atmosphere at a room temperature after the substrates are bonded in a vacuum vessel while being vacuumed. *Kotoyori* also does not disclose a conveying means having a standing part which allows the bonded substrates to stand at room temperature in the atmosphere out of the vacuum vessel while conveying the plurality of substrates for the time period required for correction of the warping before the adhesive agent being cured in the curing part.

The Office Action relies upon a configuration of not supporting the center part of the work piece as it is transmitted from the alignment stage, element 6 of Drawing 1, to the UV radiation position P2 shown on the turntable 11 in Drawing 2. As can be appreciated, there is a teaching of an immediate transfer from the bonding stage to the curing stage with either UV or a pulse radiation type of cure. See Paragraph 0039. The teaching to a person of ordinary skill in

this field would be to utilize a differential UV radiation step. The two part UV radiation curing would prevent the formation of a major warp that could occur in the normal UV curing.

This basically teaches a change in the curing step by a two part radiation process of a slight radiation initially and then a subsequently heavier radiation to thereby prevent warping. This reference does not suggest nor teach an intentional provision of a standing part before a conventional curing step as defined and claimed in our present claims.

The *Kotoyori* structure is not compatible with a single turntable arrangement, and it discloses a processing apparatus similar to the *Matsumoto et al.* reference.

Higaki et al. (U.S. Patent Publication 2002/0108715) discloses that heat warping of the bonded substrates after irradiation can be absorbed by simply allowing time for the substrates to cool and return to their original flat state. However, *Higaki et al.* does not disclose a conveying means having a standing part which allows the bonded substrates to stand at room temperature in an atmosphere out of the vacuum vessel while conveying the plurality of substrates for a time required for correction of the warping before the adhesive agent is cured in the curing part.

The Office Action also cited *Higaki et al.* which is also designed to translate stacked disks through multiple different stages as opposed to using a compact turntable arrangement. *Higaki et al.* was basically cited to teach a post-curing step after the application of UV light. It does not suggest or teach the standing part of our present claims.

Claims 16, 19, 22 and 23 were rejected over a combination of the *Hosogai, Kotoyori* and *Higaki et al.* references, when further taken in view of *Paulus et al.* (U.S. Patent No. 6,098,272) under 35 U.S.C. §103.

Paulus et al. discloses a conveying unit (25) for conveying the bonded disks from the bonding station (35) to a spin station (40) and spinning the disks to distribute the adhesive

evenly. However, *Paulus et al.* does not disclose a conveying means having a standing part which allows the bonded substrates to stand at room temperature in the atmosphere out of the vacuum vessel while conveying the plurality of substrates for the time required for correction of the warping. "Spinning the combinations to distribute the adhesive evenly" does not mean "standing the substrates for correction of the warping."

The *Paulus et al.* was also cited for purportedly teaching a standing time of 15 seconds to permit the adhesive to spread sufficiently between the substrates. As can be appreciated, the adhesive is generally spread by a spinning rotation. Actually, the cited portions of the *Paulus et al.* disclosure in the Office Action define the spin station in Column 4, Lines 33-35 and define the conveyor shown in Figure 2, to move the disk from an in-feed station 20 through the metallization station 30 with a time delay of 32 seconds so that cooling fans can cool the substrates from 250°F to approximately 80°F. There is no teaching of the standing part shown in our Figure 1 between the bonding station and before the UV curing station.

None of the references alone or in combination recognized this issue nor do they offer any solution to a problem uniquely recognized and solved by our present applicant. To assert that a person of ordinary skill in the field could then optimize such features when a person of ordinary skill in the field was not even informed of the problem or issue resolved, is not proper under MPEP §2144.05(II)(B).

New Claim 24 is allowable by defining apparatus that enable movement of substrates through the bonding position, pre-curing standing positions and curing position, since the susceptors carrying substrates are carried on the conveying means, no shifting by other devices or the like is performed. At least from the bonding station to the standing station and curing station, the susceptors carrying the substrates are conveyed without any further contact with

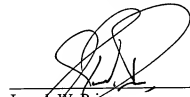
devices other than the conveying means. Accordingly, substrates that have settled into a stable state are not placed in an unstable state by any shifting operation, so that tilting can be suppressed. Even in a case where a transfer operation may be included between turntables, by transferring the substrates along with susceptors carrying these substrates, the substrates can be conveyed without any shifting operation.

Applicant believes the application is now in condition for allowance and requests an early notice of allowability.

If the Examiner believes a telephone interview will assist in the prosecution of this case, the undersigned attorney would appreciate a telephone conference.

Very truly yours,

SNELL & WILMER L.L.P.



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